

SIEMENS TRAFFIC CONTROLS LIMITED

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BH17 7ER

SYSTEM HANDBOOK

MIDAS TRANSPONDER

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TABLE OF CONTENTS

1. INTRODUCTION	6
1.1 Purpose	6
1.2 Scope	6
1.3 Related Documents	6
1.3.1 Required Documents	6
1.3.2 Reference Documents	6
1.4 Abbreviations	7
1.5 Issue State	8
1.6 SAFETY WARNING	8
1.7 Operational Warning	8
2. EQUIPMENT DESCRIPTION	9
2.1 Functionality	9
2.2 Equipment Overview	9
2.3 Physical Arrangement	13
2.4 Power System	13
2.5 Cables	14
2.6 PCBs	14
2.6.1 Power PC Processor PCB	14
2.6.2 Comms I/O PCB	15
2.6.3 V.26 Modem PCB (optional)	15
2.6.4 RS485 Line Protection Module PCB	15
3. INSTALLATION	16
3.1 Physical Installation	16
3.1.1 Installation List	16
3.1.1.1 Installation Kit	16
3.1.2 Non-Standard Tools	16
3.2 Connect RS485 Line Protection Module	16
3.3 Connect V.26 Modem data cable (optional)	17
3.4 Connect Modem to Power PC Processor	17
3.5 Earthing	18
3.6 Address Header	18
3.6.1 Programming the Address Header	18
3.6.2 Fitting the Address Header	19
3.7 Connect Mains Lead to PDU	19
4. COMMISSIONING	20
5. MAINTENANCE	21
5.1 Replaceable Parts	21
5.2 Routine Maintenance	21
5.3 Fault Finding	22
5.4 Reset	24
5.5 Replacement Procedures	24
5.5.1 Default Settings	25
5.5.2 Power PC Processor PCB	26
5.5.2.1 Power PC Processor PCB Battery	26
5.5.3 Comms I/O PCB	26
5.5.4 V.26 Modem (Optional)	27
5.5.5 Power Supply Unit	27
5.5.6 Power Supply Battery	27

5.5.7	RS485 Line Protection Module PCB	27
5.5.8	Fuses	28
5.5.8.1	Battery Fuse	28
5.5.8.2	Mains Fuse	28
5.5.8.3	Modem Fuse	28
5.5.8.4	Line Protection Module Fuse	28
6.	USE OF THE STCL ENGINEER'S TERMINAL	29
6.1	General	29
6.2	Configure	30
6.2.1	Configure Baud Rate	30
6.2.2	Get Host Status	31
6.3	Status	31
6.3.1	Station Status Data	31
6.4	Report	33
6.4.1	Fault Report	33
6.5	Logging	35
6.5.1	Logging	35
6.6	Settings	37
6.6.1	Baud Speed	37
6.7	Help	38
6.7.1	About MIDAS	39
6.8	Exit	39
6.8.1	Quit	39
7.	TECHNICAL SPECIFICATION	40
7.1	Physical Characteristics	40
7.2	Power Requirements	40
7.3	Features	40
7.4	Safety	40
7.5	EMC	40
7.6	Environmental Information	41
7.7	Data Rates	41
7.8	Battery Backup	41
7.9	Lightning Protection	41
7.10	Processor	41
7.11	Modem (Optional)	41
7.12	Engineer's Terminal	42
	APPENDIX A - TECHNICAL DRAWINGS	43
	APPENDIX B - PARTS LISTS	44
	APPENDIX C - PART NUMBERS	45
	INDEX	46

FIGURES

FIGURE 1 - MIDAS SYSTEM OVERVIEW	10
FIGURE 2 - SYSTEM SCHEMATIC DIAGRAM	11
FIGURE 3 - FRONT PANELS	12
FIGURE 4 - HARDWARE MODULE ARRANGEMENT (FRONT VIEW, FRONT PANELS REMOVED)	13
FIGURE 5 - ADDRESS HEADER	18
FIGURE 6 - INITIAL SCREEN	29
FIGURE 7 - CONFIGURE MENU OPTIONS	30
FIGURE 8 - CONFIGURE BAUD RATE DIALOG BOX	31
FIGURE 9 - STATUS MENU OPTIONS	31
FIGURE 10 - STATION STATUS DATA DIALOG BOX	32
FIGURE 11 - REPORT MENU OPTION	33
FIGURE 12 - FAULT REPORT DIALOG BOX	34
FIGURE 13 - LOGGING MENU OPTION	35
FIGURE 14 - LOGGING CONTROL DIALOG BOX	35
FIGURE 15 - LOGGING REPORT DIALOG BOX	36
FIGURE 16 - SETTINGS MENU OPTION	37
FIGURE 17 - BAUD SPEED DIALOG BOX	38
FIGURE 18 - HELP MENU OPTION	38
FIGURE 19 - ABOUT MIDAS DIALOG BOX	39
FIGURE 20 - EXIT MENU OPTION	39

TABLES

TABLE 1 - CABLE CONNECTIONS	14
TABLE 2 - LEDS	14
TABLE 3 - RS485 LINE PROTECTION CONNECTIONS	17
TABLE 4 - WIRING OF V26 MODEM CABLE	17
TABLE 5 - ADDRESS LINK VALUES	18
TABLE 6 - FAULT FINDING	24
TABLE 7 - FUSE RATINGS	28
TABLE 8 - STATION STATUS DATA DETAILS	32
TABLE 9 - FAULT REPORT DETAILS	34
TABLE 10 - LOGGING REPORT DETAILS	36

1. INTRODUCTION

1.1 Purpose

This handbook contains the information needed to install and maintain the STCL MIDAS Transponder. In the interests of Health and Safety, when installing, using or servicing the equipment, the instructions in Section 1.6 should always be followed.

1.2 Scope

This document covers the general description and installation, commissioning and maintenance instructions for the MIDAS Transponder. The Transponder configuration will determine which sections of the handbook are relevant.

1.3 Related Documents

1.3.1 Required Documents

The documents in the following table are referred to in the text of this handbook, and **are required** when installing, commissioning and maintaining MIDAS equipment.

STCL Documents	667/HB/26745/ETC	MIDAS V.26 Modem Installation, Commissioning and Maintenance Handbook (where a modem is fitted)
	667/HB/26767/ETC	MIDAS Outstation System Handbook
Highways Agency Drawings	MCX 0156 Sheets 1 and 2	NMCS Installation Cabinet 600
	MCX 0594 Sheets 2 and 3	NMCS Midas 600 Cabinet Arrangement
	MCX 0834 Sheets 1 - 4	600 Cabinet Equipment Configuration

1.3.2 Reference Documents

The documents in the following table may be referred to in the text of this handbook, but are not required when installing, commissioning and maintaining MIDAS equipment.

Highways Agency	TRG 1068 (Feb 1991)	Electro Magnetic Compatibility Test for Motorway Communications Equipment and Portable and Permanent Traffic Control Equipment
	MCG 1088 B (Jan 1996)	NMCS2 MIDAS Transponder Acceptance Test Specification

Highways Agency (Continued)	TR 1100 A (Feb 1991)	Technical & Quality Control Requirements for Systems, including parts of Systems, Manufactured, Supplied, Installed or Maintained
	TR 2066 C (Aug 1993)	HDLC Multi-Drop Communications Electrical and Protocol
	TR 2130 B (May 1993)	Environmental Tests for Motorway Communications Equipment and Portable and Permanent Road Traffic Control Equipment
	TR 2142 A (July 1993)	Message Control Message Sign Equipment
	TR 2146 C (July 1997)	MIDAS Outstation Link Specification
	TR 2168 C (Jan 1996)	MIDAS Transponder Specification
	TR 2171 A (June 1994)	LCC - Transponder Link Specification
	TR 2172 B (Sept 1994)	MIDAS Engineer's Terminal Link Specification
	TR 2173 F (Nov 1999)	MIDAS Message Specification
	TR 2178 C (Jan 1996)	MIDAS Interface Unit Specification
CCITT	K20	Lightning protection
	V.26 Modem standard	Modem standard
	V.28	Electrical Interface Specification
British Standards	BS6328 Part 1	Apparatus for connection to Private Circuits
	EN 41003	Telecommunication Safety requirement
	EN 60950	Electrical Safety requirement
	BS7671	IEE Wiring Regulations
		Control of Substances Hazardous to Health Regulations 1988

1.4 Abbreviations

COBS	Control Office Base System
CRC	Cyclic Redundancy Check
EMC	Electro Magnetic Compatibility
HDLC	Higher level Data Link Control
IDC	Insulation Displacement Connector
LCC	Local Communications Controller
MIDAS	Motorway Incident Detection and Automatic Signalling
MIU	MIDAS Interface Unit
NMCS2	National Motorway Communications System Mk 2
O/S	Outstation
PC	Personal Computer
PCB	Printed Circuit Board
PDU	Power Distribution Unit
PPC	Power PC
PSU	Power Supply Unit
STCL	Siemens Traffic Controls Limited
TPR	Transponder

1.5 Issue State

<u>Pages</u>	<u>Current Issue</u>	<u>Change Ref.</u>	<u>Type</u>	<u>Part ID</u>
1 to 47	7.00	TS000366	AMW	667/HB/26766/ETC

1.6 SAFETY WARNING

In the interests of Health and Safety when installing, using or servicing this equipment the following instructions must be noted and adhered to:

- i) Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical and electronic equipment are to be allowed to use and/or work on the equipment.
- ii) Such personnel must take heed of all relevant notes, cautions and warnings in this handbook and any other document or handbook associated with the MIDAS Transponder including, but not restricted to, the following:
 - a) The equipment must be correctly connected to the specified incoming power supply.
 - b) The equipment must be disconnected/isolated from any incoming power supply before removing any protective covers, or working on any part from which protective covers have been removed.
 - c) All wiring must be carried out in accordance with the requirements of BS7671 (IEE Wiring Regulations).
 - d) The MIDAS Transponder uses a Sealed Lead Acid Battery. Care must be taken in handling this battery to prevent a short circuit condition occurring on any of the Lead Acid Cells. The Power PC Processor PCB contains a Nickel Metal Hydride Battery which does not require special handling as it contains no mercury, cadmium or lead.
 - e) Exercise great care when handling old batteries, which may be leaking. BATTERIES MUST BE DISPOSED OF IN ACCORDANCE WITH THE "CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH REGULATIONS 1988". SPENT BATTERIES MUST BE DISPOSED THROUGH AN APPROVED HAZARDOUS WASTE DISPOSAL CONTRACTOR. **DO NOT PUNCTURE BATTERIES. DO NOT DISPOSE OF BATTERIES IN ANY FIRE.**

1.7 Operational Warning

Do not carry out a manual reset during a mains fail, as the equipment will shut down.

2. EQUIPMENT DESCRIPTION

2.1 Functionality

MIDAS Transponders are physically located adjacent to motorways that have been equipped with inductive loop vehicle detectors and associated MIDAS Outstations.

Each Transponder is attached to two communication lines of MIDAS Outstations. Each communication line can be connected to up to 12 Outstations, covering up to 5 km of motorway. The Transponder maintains a record of the current operational status of each attached Outstation.

A Transponder continuously monitors its Outstations for alerts, traffic and MIDAS equipment status data and forwards this information, together with fault reports detailing changes in Outstation operational status, via the LCC to the NMCS2 Instation. Changes in Transponder status and fault reports detailing hardware failures (e.g. mains fail) are also reported to the Instation.

The MIDAS System Overview Figure 1 shows how the Transponder and Outstation interface to one another, and to other traffic control equipment.

A serial interface allows connection of a MIDAS Engineer's Terminal, which can give identity, version and status information. It also allows monitoring of messages on the Transponder to Outstation links.

Further details of MIDAS Transponder functionality may be obtained from the MIDAS Transponder Specification, document reference TR 2168 C.

2.2 Equipment Overview

The Transponder consists of the following items, as shown in the System Schematic diagram Figure 2.

- 1 x Power PC Processor PCB
- 1 x Comms I/O PCB
- 1 x RS485 Line Protection Module PCB
- 1 x V.26 Modem PCB (Optional)
- 1 x Power Supply Unit (PSU)
- 1 x Battery backup

There is also an Address Header, not shown on Figure 2, which connects to the front of the Comms I/O PCB and is described in Section 3.6.

Links to the Transponder and LCC are generally RS485 via an MIU, but may be by V.26 modem. Both links are shown. Communications to the Outstation are always by RS485.

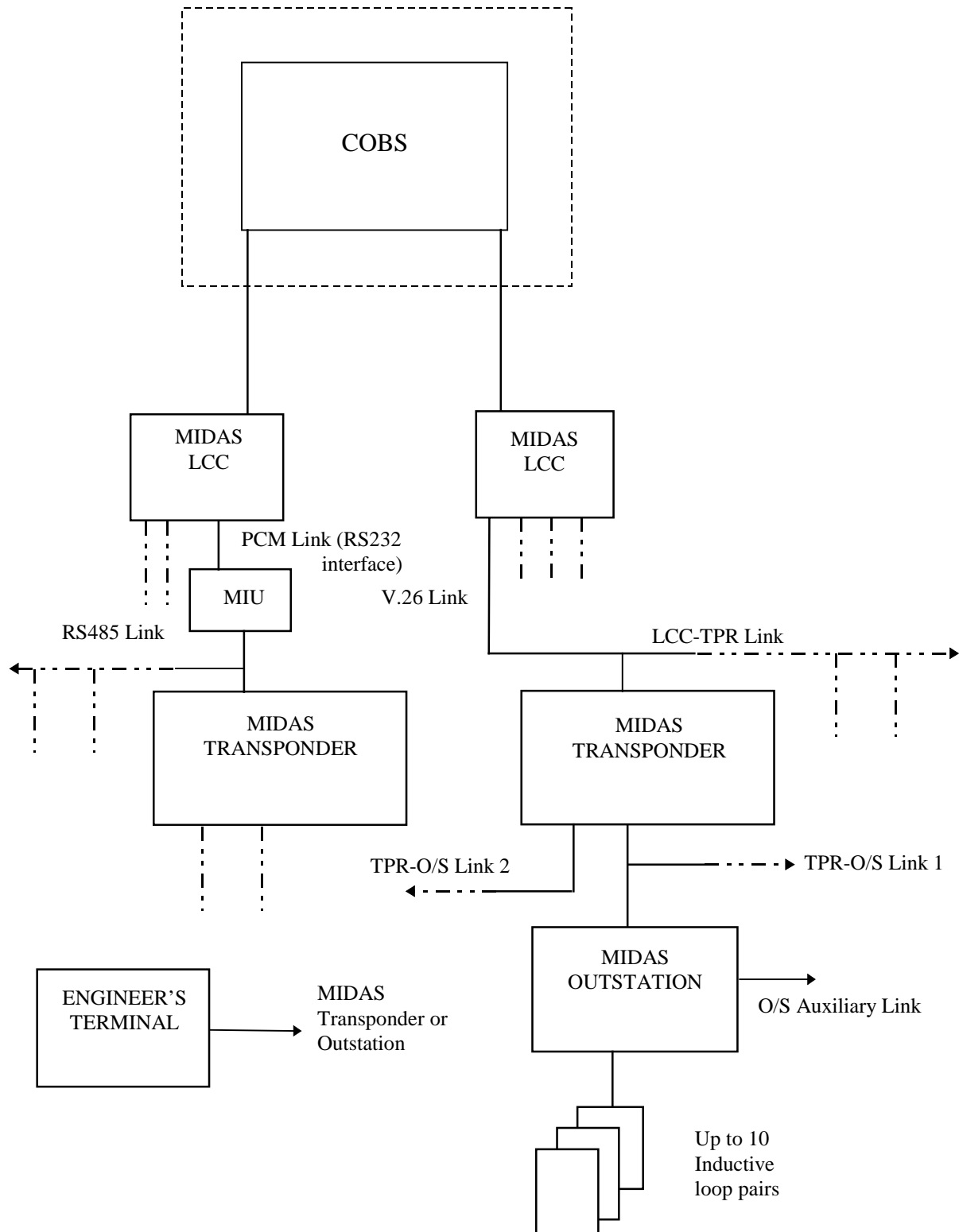


Figure 1 - MIDAS System Overview

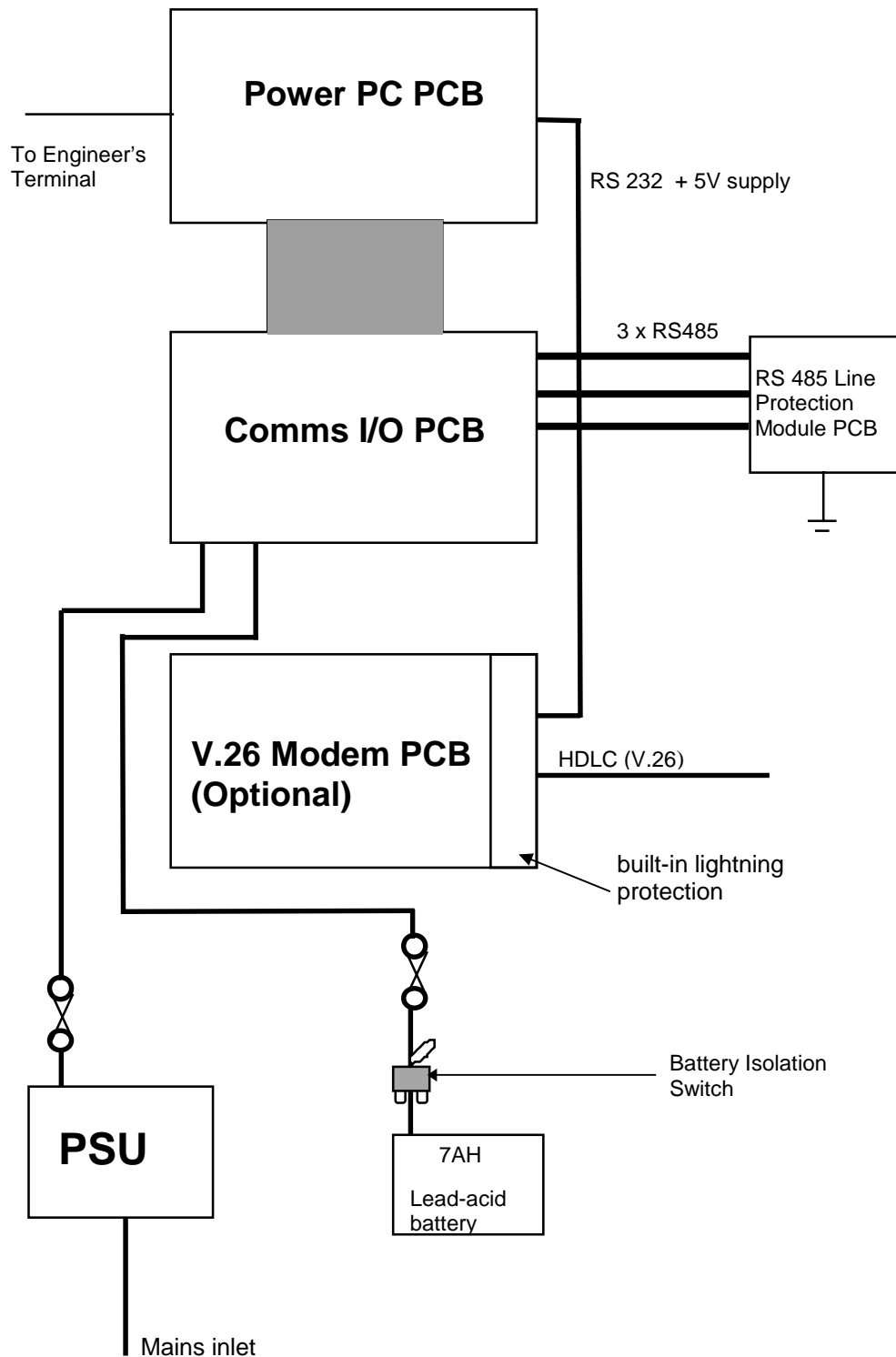


Figure 2 - System Schematic Diagram

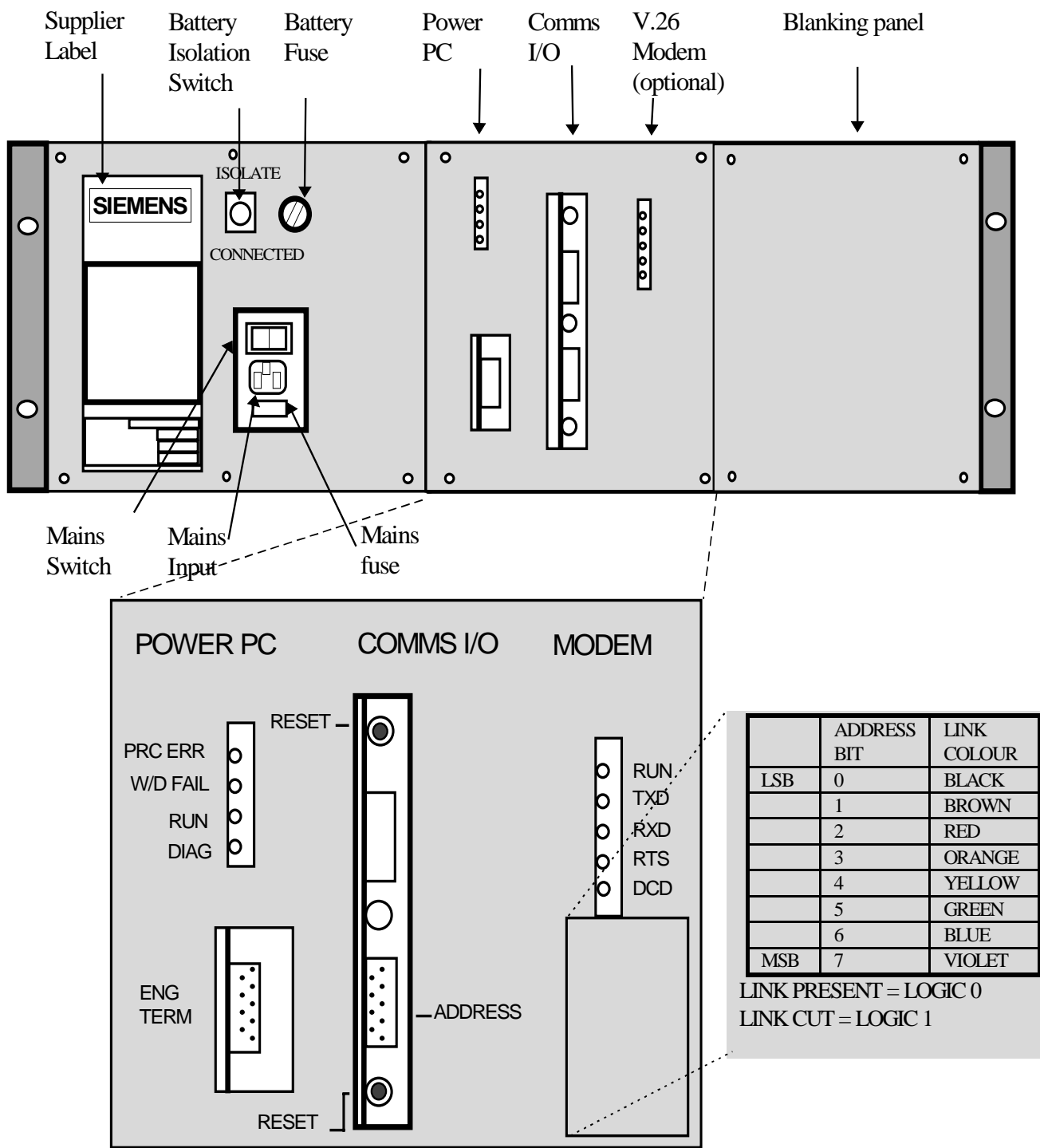


Figure 3 - Front Panels

2.3 Physical Arrangement

The MIDAS Transponder is mounted in a standard 19" equipment rack of 3U height, which provides a mounting frame and mechanical protection for all the hardware.

All RS485 inputs to the MIDAS equipment are routed through the Line Protection Module mounted at the rear of the cabinet.

A view of the equipment with the front panels removed is shown below.

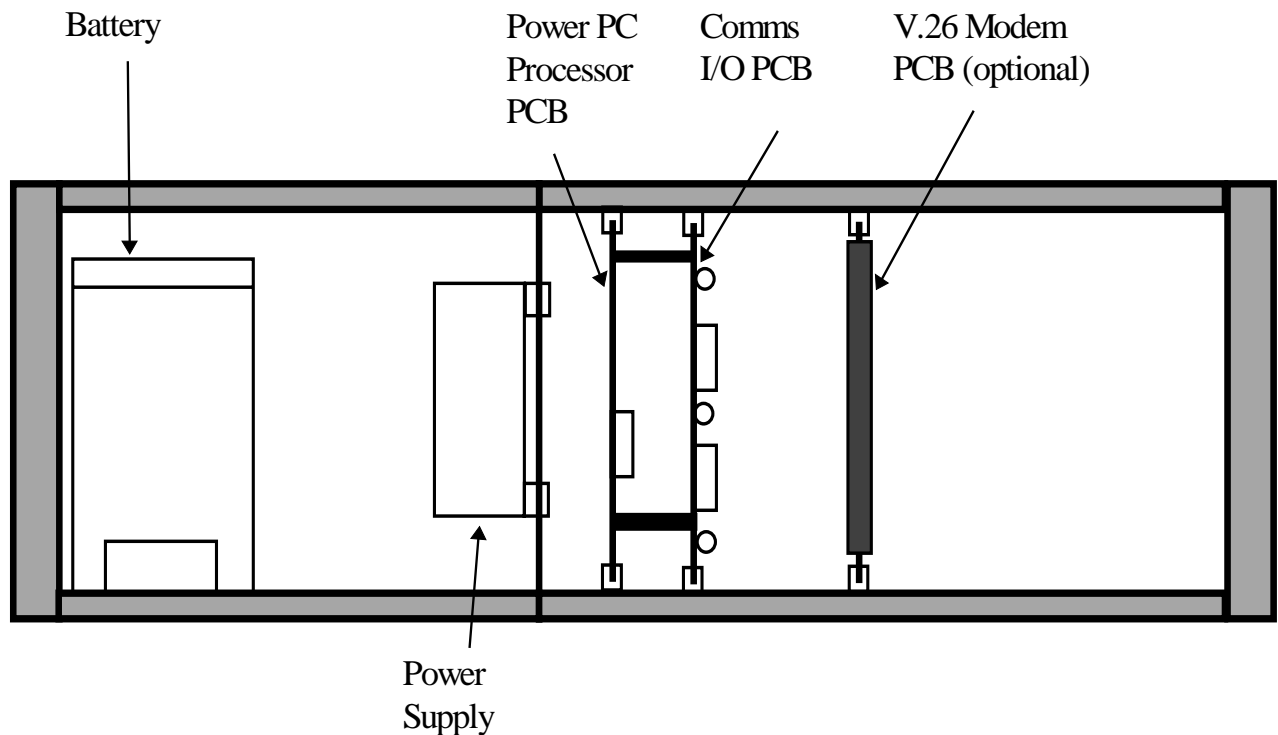


Figure 4 - Hardware Module Arrangement (front view, front panels removed)

2.4 Power System

The power supply is a 30W switched mode unit with a single voltage output. It is used to power the MIDAS Transponder hardware and charge the battery backup unit. See Section 7.2 for details of the power requirements.

The battery is a 12V sealed lead-acid type. It is capable of providing up to 20 hours cover in the event of a mains failure.

The system operates normally while the battery is being recharged. The battery is fully recharged within 5 hours of mains power restoration.

2.5 Cables

The cables are connected as follows:

Cable	Connection
Mains	Via IEC320 mains connector on the front panel. See Section 3.7.
RS485	Via Klippon block. See Section 3.2.
V.26 Modem data	Where fitted, via Klippon block on rear of cabinet. See Section 3.3.
Modem to Power PC Processor	Where fitted, via RS232 cable at the rear of the Transponder. Refer to Section 3.4.
Earths	Refer to Section 3.5.

Table 1 - Cable Connections

The Klippon block positions are to be defined by the Highways Agency.

2.6 PCBs

2.6.1 Power PC Processor PCB

The Power PC Processor PCB is based on an IBM 403GA PowerPC, which is a 32-bit Processor.

The PCB has two serial ports. One is a 9 pin 'D' type socket located on the front, into which a MIDAS Engineer's Terminal can be connected. The other, an 18-pin IDC connector located at the back, provides the interface to the optional V.26 Modem.

There are 4 LEDs located on the front, which indicate the following:

LED	Function	No Fault State	Fault Indicated State
PRC ERR	Processor Error	Off	Lit Red
W/D FAIL	Watchdog Failure	Off	Lit Red
RUN	Software running	Flashing Green	Off/Steady Green
DIAG	Software status indication	Off	Lit Green

Table 2 - LEDs

See Table 6 in Section 5.3 for details of the diagnosis and possible remedy when a fault is indicated by one of the LEDs.

2.6.2 Comms I/O PCB

The Comms I/O PCB main functions are to provide interfaces to the battery charger and battery monitor circuits and the RS485 communications channels.

At the front of the PCB (top and bottom) are two reset switches, which when pressed at the same time cause a system reset.

The Board Address Header is a 9 pin 'D' type socket above the lower reset switch. A 9-pin 'D' type plug which has the address of the Transponder configured is plugged into this socket. See Section 3.6.

2.6.3 V.26 Modem PCB (optional)

For further details of this PCB, see the MIDAS V.26 Modem Installation, Commissioning and Maintenance Handbook, detailed in Section 1.3.

2.6.4 RS485 Line Protection Module PCB

This PCB provides the Transponder with lightning protection, and connects to the rear of the cabinet.

3. INSTALLATION

3.1 Physical Installation

The Transponder is supplied fully assembled with the exception of the Address Header, Modem to Power PC Processor cable and the mains power cable. All the parts needed for an installation are contained within the packaging. Locate the Installation kit of parts which contains all the fixings required to install the unit and check it against Section 3.1.1.1. No specialised tools are required other than those listed in Section 3.1.2.

Insert the cage nuts into the required positions in the front of the Type 600 frame using four bolts and washers at the front. The location of the unit within the Type 600 frame is detailed in the Highways Agency installation drawings.

3.1.1 Installation List

- Transponder Assembly
- V.26 Modem to Power PC Processor ribbon cable (optional)
- Transponder Installation Kit (See Section 3.1.1.1 below).

3.1.1.1 Installation Kit

The following items are provided in a plastic bag tie-wrapped to the rack.

4 x Cage Nuts
4 x Bolts
4 x Washers
1 x Address Plug
1 x Mains Power Cable

3.1.2 Non-Standard Tools

The only items needed to complete an installation are a normal set of Engineer's tools and the following:

- Indelible pen for marking the address on the Address Header.

3.2 Connect RS485 Line Protection Module

Connect the module in accordance with the table below. It is advisable to fit the RS485 Line Protection module to the Klippon block before terminating its earth lead (see Section 3.5). This ensures that the earth lead is long enough to reach the appropriate earthing point in the cabinet.

Refer to the Highways Agency installation requirements for specific fitting instructions. See also the Highways Agency drawing MCX 0834 sheets 1 and 4 for more details.

Ensure that the switch on the front of the Comms I/O card is in the "up" position to connect the RS485 circuits to Outstation Link 1.

Terminal Block Position	Link Function	RS485 Polarity
1	Transponder - Outstation Link 1	A
2	Transponder - Outstation Link 1	B
3	Transponder - LCC Link	A
4	Transponder - LCC Link	B
5	Not used	-
6	Not used	-
7	Transponder - Outstation Link 2	A
8	Transponder - Outstation Link 2	B
9	Not used	-
10	Not used	-
11	Not used	-
12	Not used	-

Table 3 - RS485 Line Protection Connections

3.3 Connect V.26 Modem data cable (optional)

Where provided, connect the HDLC modem cable according to the following table:

Pin No.	Terminal Block ref.	Colour
TB1/1	Command	Blue/White
TB1/2	Reply	Orange/White
TB1/3	Reply	White/Orange
TB1/4	Command	White/Blue

Table 4 - Wiring of V26 Modem Cable

This cable is terminated by a four way screw terminal on the Modem, labelled TB1.

3.4 Connect Modem to Power PC Processor

Where a Modem is provided, connect the 18-way ribbon cable between the rear of the Modem and the 18 pin IDC connector located at the back of the Power PC Processor PCB, labelled PL4. The Modem cable is terminated with an 18-way IDC plug. The red wire indicates Pin 1 of the cable.

3.5 Earthing

The Transponder has a flying earth lead that is attached to the front panel star point. There is also a flying earth lead on the RS485 Line Protection module. Where fitted, there is an earth lead from the V.26 modem. These flying earth leads must be fed down the side of the T600 cabinet, and terminated on the cabinet earth point.

3.6 Address Header

This sets the address of the unit in binary.

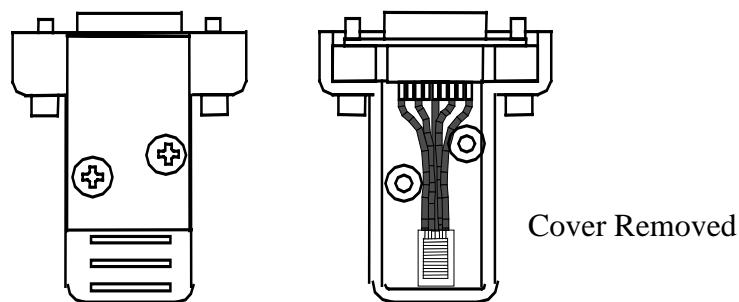


Figure 5 - Address Header

3.6.1 Programming the Address Header

Dismantle the unit by removing the two front cover screws, and cut the links where appropriate. The table below gives details of the link values.

	Address Bit	Link Colour
LSB	0	Black
	1	Brown
	2	Red
	3	Orange
	4	Yellow
	5	Green
	6	Blue
MSB	7	Violet

Link Present = Logic 0

Link Cut = Logic 1

Table 5 - Address Link Values

For example: To set Address 5 hex (00000101 bin), cut the Black and Red links.

To set Address 55 hex (01010101 bin), cut the Black, Red, Yellow and Blue links.

To set Address 42 hex (01000010 bin), cut the Brown and Blue links.

To set Address 97 hex (10010111 bin), cut the Black, Brown, Red, Yellow and Violet links.

Write the address on the white label in indelible pen.

3.6.2 Fitting the Address Header

Reassemble and fit the address header into the front connector of the Comms I/O PCB (See Figure 3). Screw it securely to the PCB.

3.7 Connect Mains Lead to PDU

Ensure the mains power to the cabinet is turned off before starting to connect the power lead.

Connect the mains lead in accordance with Highways Agency drawings MCX 0156 sheets 1 and 2. The PDU is located in the base of the equipment cabinet.

4. COMMISSIONING

The MIDAS Transponder requires minimal commissioning consisting of the following:

Check the Transponder Address is correct for the location.

Turn the power on at the mains switch.

Make sure that the Battery Isolation Switch is set to Connected.

Check the Power PC LEDs. (RUN LED is flashing green, others should be off.)

Connect an Engineer's Terminal and proceed as follows:

- Configure the baud rate as described in Section 6.2.
- Check the Station Status Data dialog box. The status should be as seen on Figure 10. "Master Link" should show OK, which indicates that the Transponder is communicating with the Instation.
- Check at the Control Office or Instation that communications have been established. Communications are established when the Transponder receives site data from the Instation.
- Check the Fault Report. If "Battery low" does not appear, then the battery voltage is OK. If a "Battery low" fault appears, wait at least one hour for the battery to become sufficiently charged, when the fault should clear.
- If the Transponder is working correctly, no faults will appear in the Fault Report.
- If Outstations are connected to the RS485 master links, check that messages are being transmitted and received by enabling the Logging Control dialog box (see Figure 14). Outstation messages will then appear on Links 0 and 1 if they are connected correctly.

For a Modem based Instation link, check that TXD and RXD red LEDs flash. Also check the MIDAS Station Status Data menu for the master link is OK.

Where a Modem is fitted, follow the Commissioning instructions in the V.26 Modem Handbook, detailed in Section 1.3.

Note: A telephone and fax "Help Line" facility is available. See page 2 for details.

5. MAINTENANCE

Before undertaking any maintenance of the equipment, read the Safety Instructions in Section 1.6.

When maintenance and refitting is carried out on other equipment within the cabinet, it may be necessary to move MIDAS equipment, in particular the RS485 Line Protection Module. Follow the instructions given for replacing individual items of equipment in Section 5.5.

For the MIDAS Transponder internal layout see Figure 4, and for the front panels see Figure 3.

5.1 Replaceable Parts

The following parts are replaceable. Follow the instructions given in the remainder of this section for replacing individual parts.

See Appendix C for the part numbers.

- Address Header
- Battery Backup fuse
- Comms I/O PCB
- Line Protection Module fuse
- Mains fuse
- Modem fuse
- Power PC Processor PCB Battery
- Power Supply Battery
- Power Supply Unit
- RS485 Line Protection Module PCB
- Transponder Power PC Processor PCB
- Transponder PROM
- V.26 Modem

5.2 Routine Maintenance

The only routine maintenance required is the replacement of batteries. There are two types of battery in each Transponder. Before removing or replacing batteries, read the Safety Warning in Section 1.6.

One is the power supply battery backup, which is a 12V sealed lead-acid type, with an estimated life of 5 years. Instructions for replacing the power supply battery can be found in Section 5.5.6.

The other is the RAM battery backup. This is a nickel metal hydride type contained within the Power PC Processor PCB that has an estimated minimum life of 6 years. Follow the instructions in Section 5.5.2.1 to replace this battery.

To minimise site visits, it is recommended that both batteries are replaced at the same time. Therefore a replacement schedule should be prepared which ensures that each battery is replaced no later than five years from the date of delivery.

5.3 Fault Finding

Listed below are the main faults that might be reported by Transponders. If any fault is reported which is not listed below, or a fault persists after trying the remedy(ies) suggested, consult STCL (see page 2 for details).

Symptom	Diagnosis	Remedy
The PRC ERR LED on the Power PC PCB is lit	Processor error.	Replace the PPC PCB. Consult STCL (see page 2).
	Software exception error.	Replace the PPC PCB. Consult STCL (see page 2).
The W/D FAIL LED on the Power PC PCB is lit	The watchdog has failed.	Reset the Transponder. (DO NOT reset if the mains has failed. See Section 5.4). Check the watchdog link is shorted (LK5 on PPC PCB).
	Hardware fault.	Reset the Transponder. (DO NOT reset if the mains has failed. See Section 5.4). If the fault persists, replace and return the PPC.
The RUN LED on the Power PC PCB is not flashing	Software is not running.	Reset the Transponder. (DO NOT reset if the mains has failed. See Section 5.4). If the fault persists, replace and return the PPC.
	Hardware fault.	Reset the Transponder. (DO NOT reset if the mains has failed. See Section 5.4). If the fault persists, replace and return the PPC.
The DIAG LED on the Power PC PCB is lit	There is a fault reported in the Fault Log.	Refer to the Fault Log for further information. See Section 6.4.1.
A battery low fault is reported at the Instation	The battery is not charging.	Check the Battery Isolation Switch is set to connected. Replace the battery.

Symptom	Diagnosis	Remedy
	The battery is disconnected.	Check the battery connections. Check the Battery Isolation Switch is set to connected. Check the battery fuse.
	The Comms I/O has failed.	Replace the Comms I/O module.
A Mains fail fault is reported at the Instation	The Mains is disconnected.	Check that the mains is connected.
	The Mains has failed.	Check the mains fuse. Check the mains supply. DO NOT reset the Transponder. See Section 5.4.
	The PSU has failed.	The PSU output should be 15V +1V. If not, replace the PSU.
	The Comms I/O has failed.	Replace the Comms I/O module.
A battery charger fault is reported at the Instation	The Battery is not charging.	Check the battery leads. Check the battery fuse. Replace the battery.
	The Battery is disconnected.	Check the battery connections. Check the Battery Isolation Switch is set to connected. Check the battery fuse.
	The Comms I/O has failed.	Replace the Comms I/O module.
A fault report is received at the Instation reporting that at least one, but not all, Outstations are unobtainable	The Outstation has failed.	Check the Outstation(s).
	The site configuration is wrong.	Check the site configuration.
A fault report is received at the Instation reporting that all Outstations on one link are unobtainable	The Outstation link has failed.	Check the Outstation link connections. Check that the switch on the front of the Comms I/O card is in the “up” position. Check the site configuration.
	The Comms I/O has failed.	Replace the Comms I/O module.

Symptom	Diagnosis	Remedy
	The Line Protection Module has failed.	Replace the RS485 Line protection module fuse. Replace the RS485 Line protection module.
A fault report is received at the Instation reporting that at least one, but not all, Outstations are not responding	The Outstation has failed.	Check the Outstation(s).
RS485 Communications are lost between Instation and Transponder	The Instation link has failed.	Check the Instation link connections. Check the site configuration.
	The Comms I/O PCB has failed.	Replace the Comms I/O module
	The Line Protection Module has failed.	Check the RS485 Line Protection Module fuse. Replace the RS485 Line Protection Module.
Modem Communications are lost between Instation and Transponder	The Instation link has failed.	Check the Instation link connections. Check the site configuration.
	The Modem has failed.	Replace the modem fuse. Replace the modem.
Any other fault report or message.		Reset the Transponder (DO NOT reset if the mains has failed. See Section 5.4). If the fault persists, consult STCL (see page 2).

Table 6 - Fault Finding

5.4 Reset

Note: **Do Not** carry out a manual reset during a mains fail, as the equipment will shut down.

To carry out a reset, locate the two buttons marked “Reset” on the front of the Comms I/O PCB (see Figure 3) and press both at the same time. The system then restarts.

5.5 Replacement Procedures

Please note that PCB switches are factory set. Check with Section 5.5.1 that the PCB is the correct one and that the default settings are correct before fitting the replacement. Part numbers for all the replaceable parts are given in Appendix C.

5.5.1 Default Settings

The following table shows the factory default settings for the various items of equipment.

It is important to ensure that the equipment uses the settings detailed below when installed.

	Default Setting	Meaning
Power PC Processor PCB Battery switch Watchdog Disable LK5 All other links	On Shorted Open	Battery connected Watchdog enabled Not used
Comms I/O PCB PCB Add (S6,1 (2 (3 (4 RS485 Line Voltage Biasing{ S2 { S4 { S5 { S8 Local/Remote Toggle switch on front	On Off Off Off On (Down) Off (Up) Off (Up) On (Up) Up	One PCB in rack (Would be on if 2 PCBs in rack, others in S6 off) (Would be on if 3 PCBs in rack, others in S6 off) Not used Bias enabled, O/S Link 1 Bias disabled, LCC Link Bias disabled, Not used Bias enabled, O/S Link 2 RS485 enabled to O/S Link 1
Optional V.26 Modem PCB - 2400 Baud Rate See the MIDAS V.26 Modem I C & M Handbook. Details in Section 1.3.		
Link Data Rates (Set via Engineer's Terminal. See Section 6.6.1) OAL ETR Upstream Downstream 1 Downstream 2	Any 9600 4800 4800 4800	Not used Baud speed Baud speed Baud speed Baud speed

5.5.2 Power PC Processor PCB

1. The PCB contains a nickel metal hydride rechargeable battery. Note the Safety Warning in Section 1.6.
2. Switch off at the main power switch. See Figure 3.
3. Switch the battery off at the Battery Isolation Switch.
4. Undo the four screws holding the front panel and remove it.
5. Disconnect the 4 way Molex connector on the Comms I/O PCB. The PCB positions are identified on Figure 4.
6. Disconnect the 10 way IDC connector on the rear of the Comms I/O PCB.
7. Disconnect the 18 way IDC connector on the rear of the Power PC Processor PCB (if a Modem is fitted).
8. Pull out the Power PC Processor PCB (PPC) and Comms I/O modules.
9. Disconnect the PPC from the Comms I/O PCB by undoing the four spacer screws.
10. Pull the PPC and Comms I/O units apart.
11. Replace the PPC Board. Before fitting the new board check that the default settings correspond with those in Section 5.5.1. Also make sure that the PROM part number is the same as that listed in Appendix C.
12. Reverse the above procedures to reassemble and reconnect the PCBs.

5.5.2.1 Power PC Processor PCB Battery

1. To replace the battery, follow items 1 - 10 from Section 5.5.2 above.
2. Desolder the battery (labelled BAT1) from the PCB.
3. Replace the battery and solder securely to the PCB.
4. Fix a new date label on the battery.
5. Reassemble and reconnect the PCBs.

5.5.3 Comms I/O PCB

1. Switch off at the main power switch. See Figure 3.
2. Switch the battery off at the Battery Isolation Switch.
3. Undo the four screws holding the front panel and remove it.
4. Disconnect the 4 way DC power cable connector on the Comms I/O PCB. The PCB positions are identified on Figure 4.
5. Disconnect the 10 way IDC connector on the rear of the Comms I/O PCB.
6. Pull out the Power PC Processor PCB (PPC) and Comms I/O modules.
7. Disconnect the PPC from the Comms I/O PCB by undoing the four spacer screws.
8. Pull the PPC and Comms I/O units apart.
9. Replace the Comms I/O Board. Before fitting the new board check that the default settings correspond with those in Section 5.5.1.
10. Reverse the above procedures to reassemble and reconnect the PCBs.

5.5.4 V.26 Modem (Optional)

See the MIDAS V.26 Modem Installation, Commissioning and Maintenance Handbook for replacement instructions. Details are given in Section 1.3.

5.5.5 Power Supply Unit

1. Disconnect the mains and isolate the battery using the Battery Isolation Switch on the front panel (See Figure 3).
2. Remove the left hand front panel (with the Supplier label).
3. Disconnect the DC output and mains input plugs.
4. Remove the earth lead from the screw on top of the PSU board.
5. Remove the screws holding the PSU.
6. Remove the PSU.
7. Fit the new PSU.
8. Re-connect the mains earth lead to the screw on top of the PSU board.
9. Re-connect the input and output plugs.
10. Re-fit the front panel.
11. Connect the battery using the Battery Isolation Switch, and re-connect the mains.

5.5.6 Power Supply Battery

1. Disconnect the mains and isolate the battery using the Battery Isolation Switch on the front panel (See Figure 3).
2. Remove the left hand front panel (with the Supplier label).
3. Slide out the battery and disconnect the battery terminals.
4. Replace the battery.
5. Re-connect the terminals to the replacement battery.
6. Replace the front panel.
7. Switch on the battery at the Battery Isolation Switch on the front panel.
8. Re-connect the mains.
9. Handle and dispose of the battery safely in accordance with the Safety Warning in Section 1.6.

5.5.7 RS485 Line Protection Module PCB

This module protects the equipment against induced voltage transient and excessive line voltages/currents. The fuses will blow if excessive currents are coupled into the lines. It is unlikely that the module will require replacement, but it may need to be moved within the cabinet when rewiring is carried out or new equipment is fitted.

Proceed as follows:

1. Remove the cabling.
2. Unscrew the module from the cabinet rear cage ribs and remove.
3. Fit the new module by screwing to the cabinet rear cage ribs.
4. Refit the cabling.

5.5.8 Fuses

Location	Fuse	Rating
Front panel	Battery backup fuse	3.15AF
Front panel	Mains fuse	250V, 500mA, Slow blow
Modem - if fitted	Modem fuse	250V, 500mA, Quick blow
RS485 Line Protection Module	Line Protection module fuse	250V, 1 Amp, Anti-surge (T)

Table 7 - Fuse Ratings

5.5.8.1 Battery Fuse

Isolate the battery using the Battery Isolation Switch. Remove the fuse and replace with one of the same rating on the battery front panel.

Re-connect the battery at the Battery Isolation Switch.

5.5.8.2 Mains Fuse

Isolate the mains using the Mains Switch. Isolate the battery using the Battery Isolation Switch.

Remove and replace the fuse in the mains socket. See Figure 3.

Re-connect the battery at the Battery Isolation Switch. Re-connect the main power using the Mains Switch.

5.5.8.3 Modem Fuse

Isolate the mains using the Mains Switch.

Remove the front cover from the panel containing the modem (see Figure 3) and slide out the V.26 modem. Remove the plastic cover. Replace fuses FS1 to FS4 as required. Replace the plastic cover and refit the modem into its previous position. Replace the front panel using the four screws.

Re-connect the main power.

5.5.8.4 Line Protection Module Fuse

Remove the plastic cover from the Line Protection Module. Replace fuses FS1 to FS8 as required. Replace the cover.

6. USE OF THE STCL ENGINEER'S TERMINAL

6.1 General

Note: The following section applies *only* to the use of an STCL Engineer's Terminal.

This section assumes that the user is familiar with Windows® software and terminology.

Plug the terminal in to the socket shown on Figure 3.

Log in in the usual way and select the MIDAS Engineer's Terminal icon from the Main Menu.

See the figure below for the initial screen displayed on entry to the Engineer's Terminal.

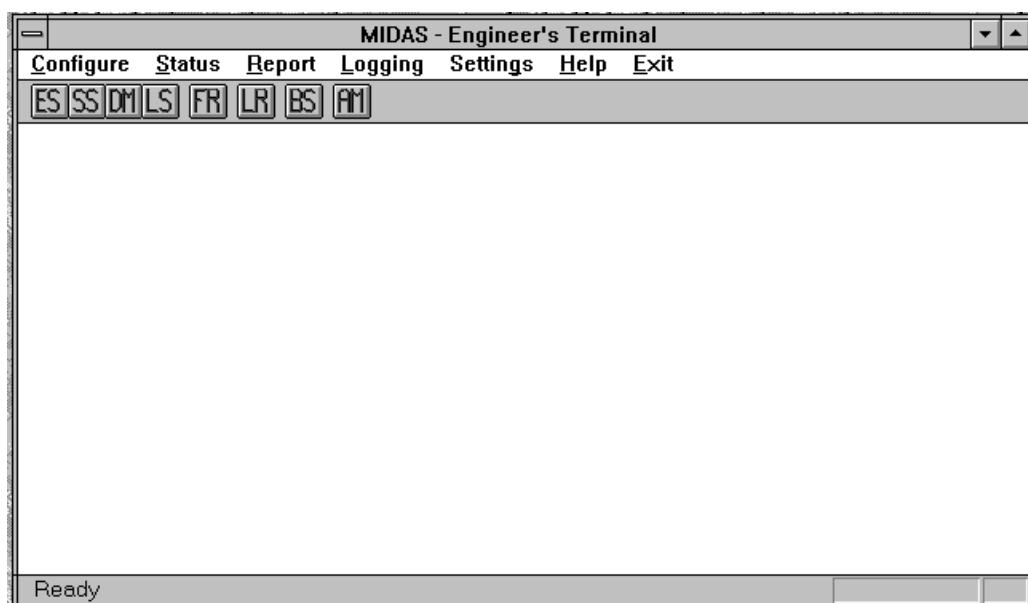


Figure 6 - Initial Screen

Note: The menus and buttons displayed on the initial screen show options that relate to the MIDAS Outstation as well as the Transponder. Not all options are available when the Engineer's Terminal is connected to the Transponder, and any attempt to select them causes a message to be displayed indicating that the selection is not valid. Only the options available from a Transponder are described in this section.

On the MIDAS Main Menu Window, under the menu bar, there are buttons that give easy access to the options listed below (See the figure above):

- SS - Station Status
- FR - Fault Report
- LR - Logging Report
- BS - Baud Speed
- AM - About Midas

These options are described in detail later in this section.

There is also a status bar at the bottom of the window. On the left hand side there is a summary of what each menu option can do. On the right hand side there are two small windows; the larger one displays the name of the device the Engineer's Terminal is connected to (i.e. Transponder), and the smaller window shows the address of the device. Until the Engineer's Terminal has been configured as described in Section 6.2 these windows are blank. For example, page 29 shows the screen before the Terminal has been configured; page 33 shows the screen after configuration.

6.2 Configure

This menu confirms the connection of the Engineer's Terminal to the host, and these options should be selected before using any of the remaining menu options.

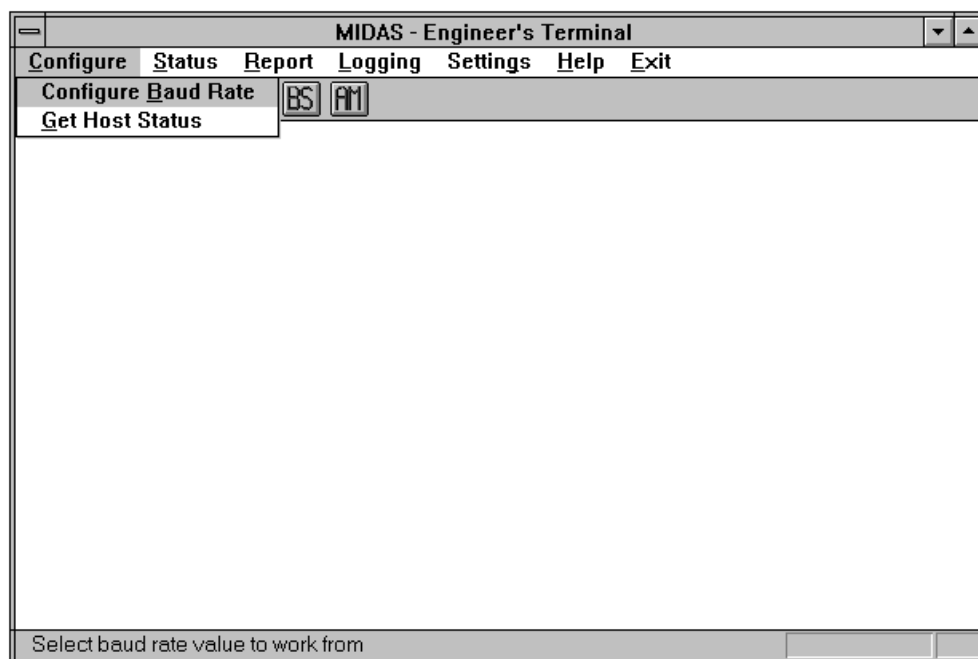


Figure 7 - Configure Menu Options

6.2.1 Configure Baud Rate

Choose from 9600, 4800 or 2400 baud speed for the Engineer's Terminal to communicate with the Transponder. Click on the <OK> button to confirm the entry and close the window. <Cancel> closes the window without making any change to the entry.

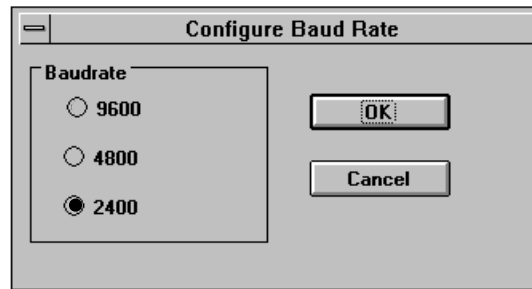


Figure 8 - Configure Baud Rate Dialog Box

6.2.2 Get Host Status

Selecting this option identifies the name and address of the device to which the Engineer's Terminal is connected. The information is then displayed in the status bar at the bottom of the window.

6.3 Status

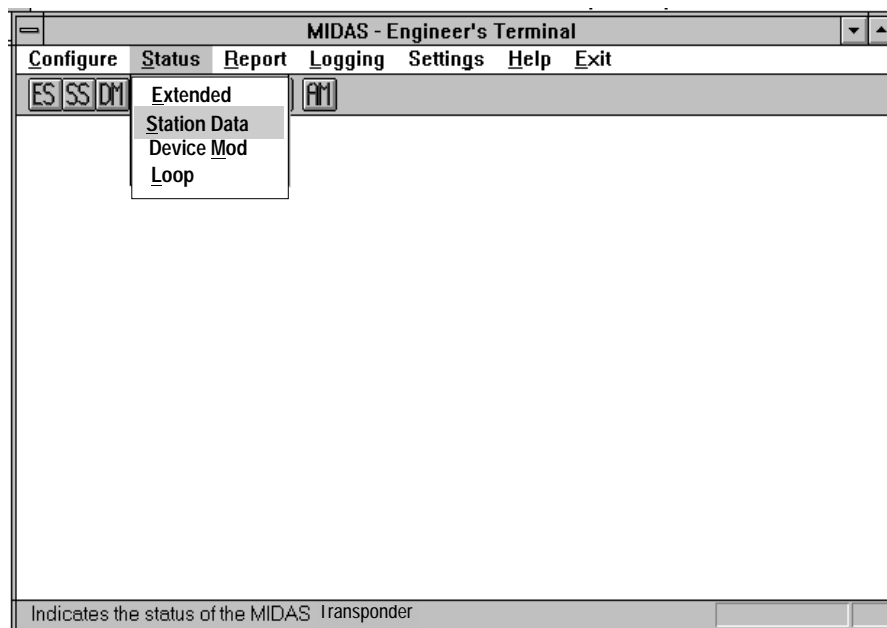


Figure 9 - Status Menu Options

6.3.1 Station Status Data

This facility displays a view-only dialog box with the data obtained from the Station Status Data message. Click on the <OK> button to close the window.

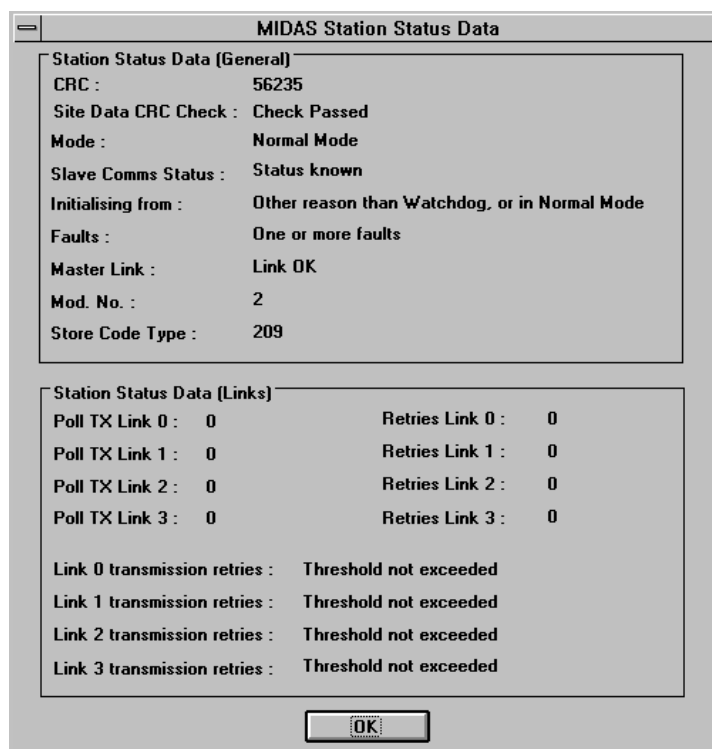


Figure 10 - Station Status Data Dialog Box

Dialog Box Field	Possible Data	Explanation
CRC	0 - FFFF	CRC of Site Data
Site Data CRC Check	Passed/Failed <i>or</i> not done	Status of CRC Check
Mode	Normal <i>or</i> Initialisation	Current mode of Transponder
Slave Comms Status	Known <i>or</i> not known	Status of Slave Comms
Initialising from	Watchdog reset, <i>or</i> other reason than in Watchdog, <i>or</i> in Normal mode	Reason for initialisation
Faults	One or more, <i>or</i> none	Number of faults
Master Link	OK, <i>or</i> re-established	Transitory indication – do not use
Mod. No.	Modification Number	Modification Number
Store Code Type	Code	Store Code Type
Poll TX Link n	Number	Transmission Counter for Link n
Retries Link n	Number	Transmission Retries Counter for Link n
Link n transmission retries	Exceeded, <i>or</i> not exceeded	Transmission Retries Threshold for Link n

Note : Where n is a value of 0, 1, 2 or 3.

Table 8 - Station Status Data Details

6.4 Report

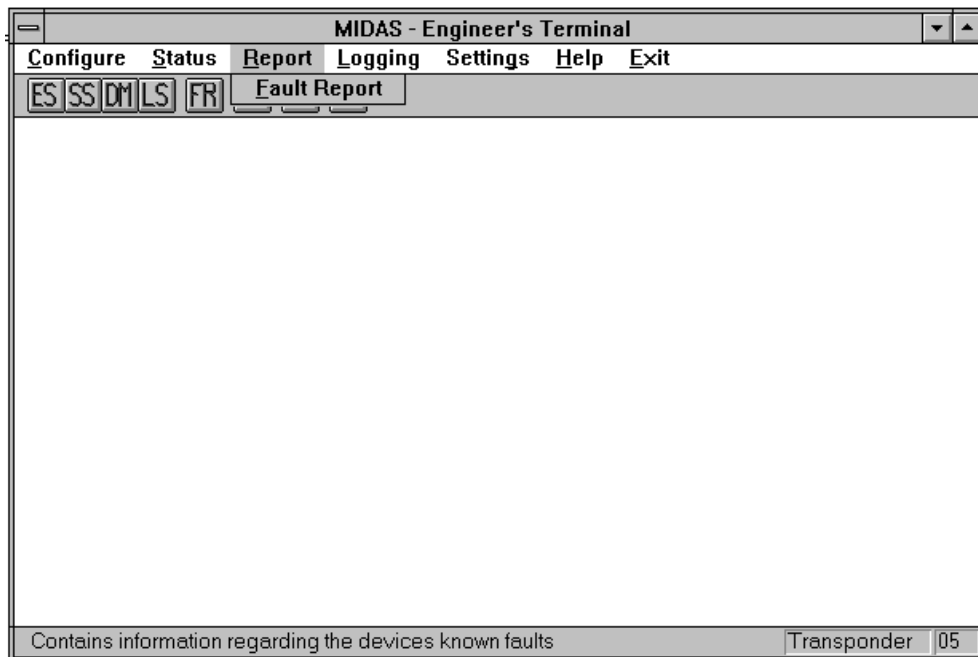


Figure 11 - Report Menu Option

6.4.1 Fault Report

This facility displays a view-only dialog box with the data obtained from the Fault Report message. Click on the <OK> button to close the window. Click on the <Save> button to save the contents of the window to a text file. You are prompted to enter a name and destination for the text file.

Access the text file and print the fault report (if required) in the usual way.

Time	Fault Type	Device Addr	Data	Category	Diagnostics

OK Save

Figure 12 - Fault Report Dialog Box

Dialog Box Field	Possible Data	Explanation
Time	0-23 for hours, 0-59 for minutes, 0-59 for seconds	Time the fault or clearance of fault occurred
Fault Type	Text	Name of the fault See Section 5.3 for diagnosis and remedy for each fault
Fault Status	Clear <i>or</i> Fault	Fault cleared or fault occurred
Device	Transponder (TPR) <i>or</i> Outstation (O/S)	The device reporting the fault
Addr	Number	Address of the device
Data	Number	Dependent on fault type – For engineering use only
Category	Fatal, Error <i>or</i> Warning	Category of fault
Diagnostics	Number	Dependent on fault type - For engineering use only

Table 9 - Fault Report Details

6.5 Logging

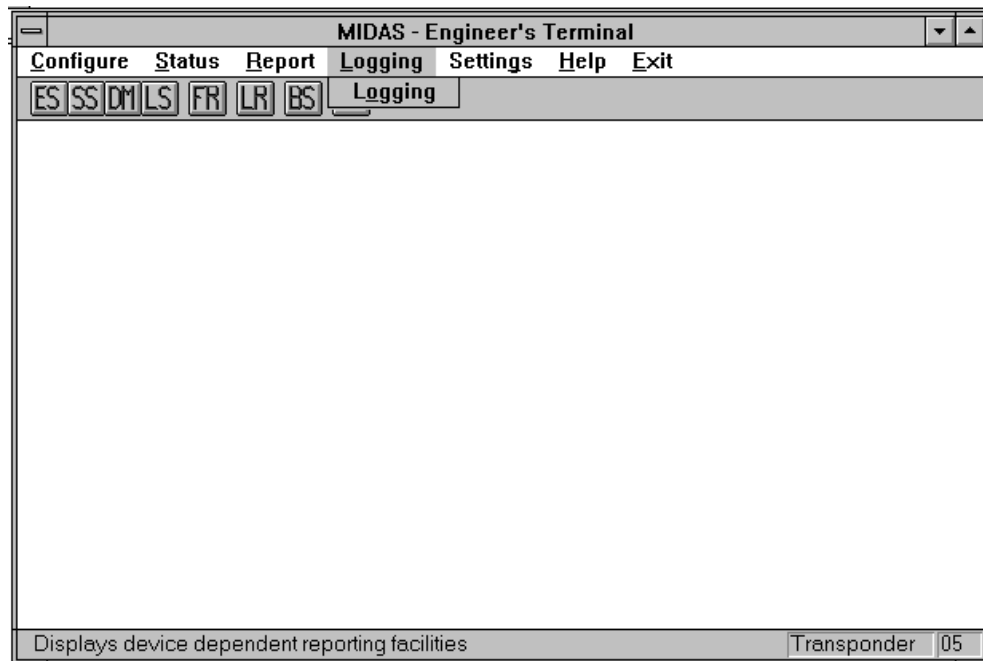


Figure 13 - Logging Menu Option

6.5.1 Logging

This facility displays a dialog box. The data to be displayed can be enabled or disabled, by clicking on the required check box(es). When a change is made in the window and the <OK> button is pressed a dialog box appears, "Are you sure you want to Enable/Disable these functions?".

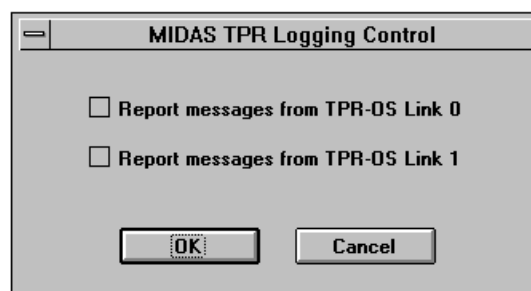


Figure 14 - Logging Control Dialog Box

The <Cancel> button closes the dialog box without saving any changes and re-displays the main screen (see Figure 6). The <OK> button closes the window and then a further window prompts for a file name and destination for the logging data. Make entries where appropriate on the screen and press <OK>.

The Logging dialog box (see the next figure) then appears, where messages are displayed as they are sent and received. This information may not be changed.

The <Pause> button in the Logging box stops the scrolling of messages in the window.

The <OK> button in the Logging box closes the dialog box.

The <Resume> button in the Logging box starts the scrolling of messages in the window again.

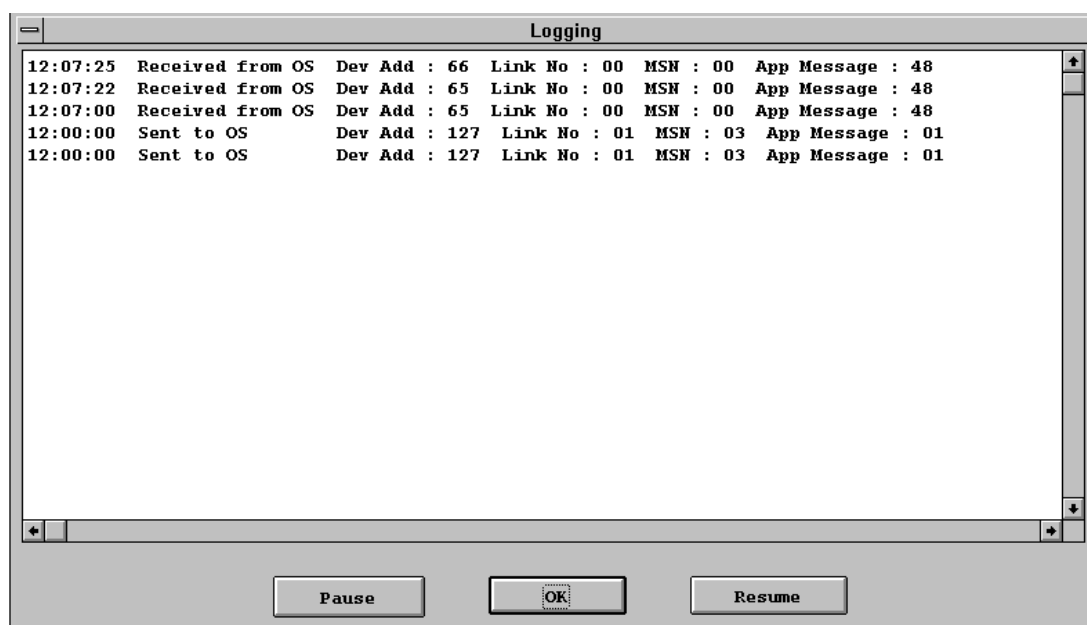


Figure 15 - Logging Report Dialog Box

Dialog Box Field	Possible Data	Explanation
Time	0-23 for hours, 0-59 for minutes, 0-59 for seconds	Time the fault or clearance of fault occurred
Message Data	Text	Dependent on Type of Message
Sequence Number	0-255	Sequence number of the Alert
Site Number	Number	Dependent on Type of Message
Alert Data	0 – 255	Lane in Alert

Table 10 - Logging Report Details

6.6 Settings

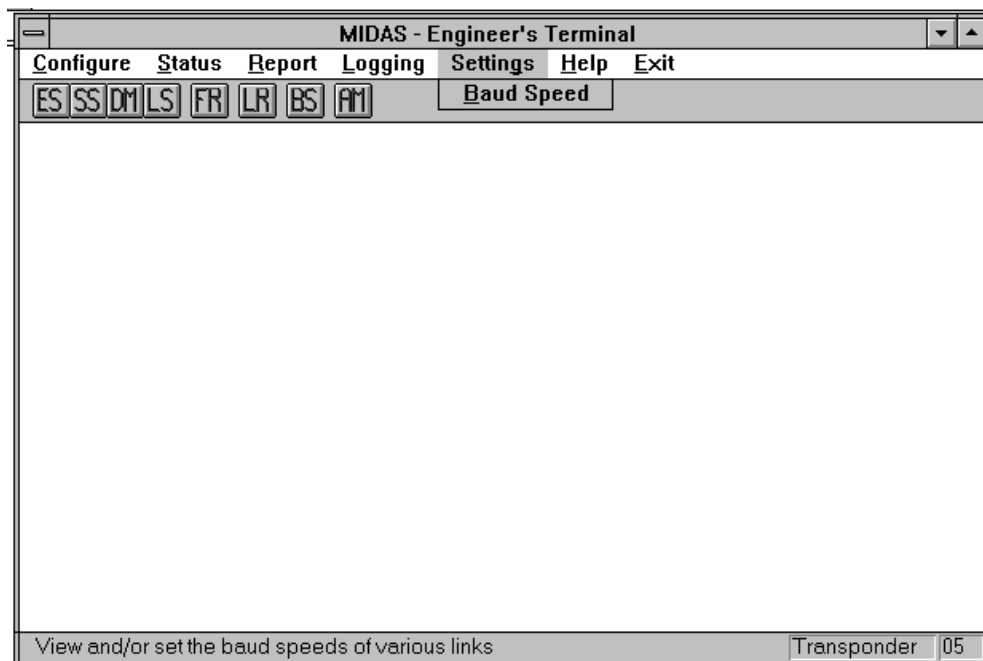


Figure 17 - Settings Menu Option

6.6.1 Baud Speed

This facility displays a dialog box with the data obtained from the Baud Rate Reply message. The data can be changed, by clicking on the required radio buttons. Click on the <OK> button to close the window, recording any changes made to the baud rates of individual links. Click on the <Cancel> button to close the window without saving any changes. See Section 5.5.1 for details of the default values.

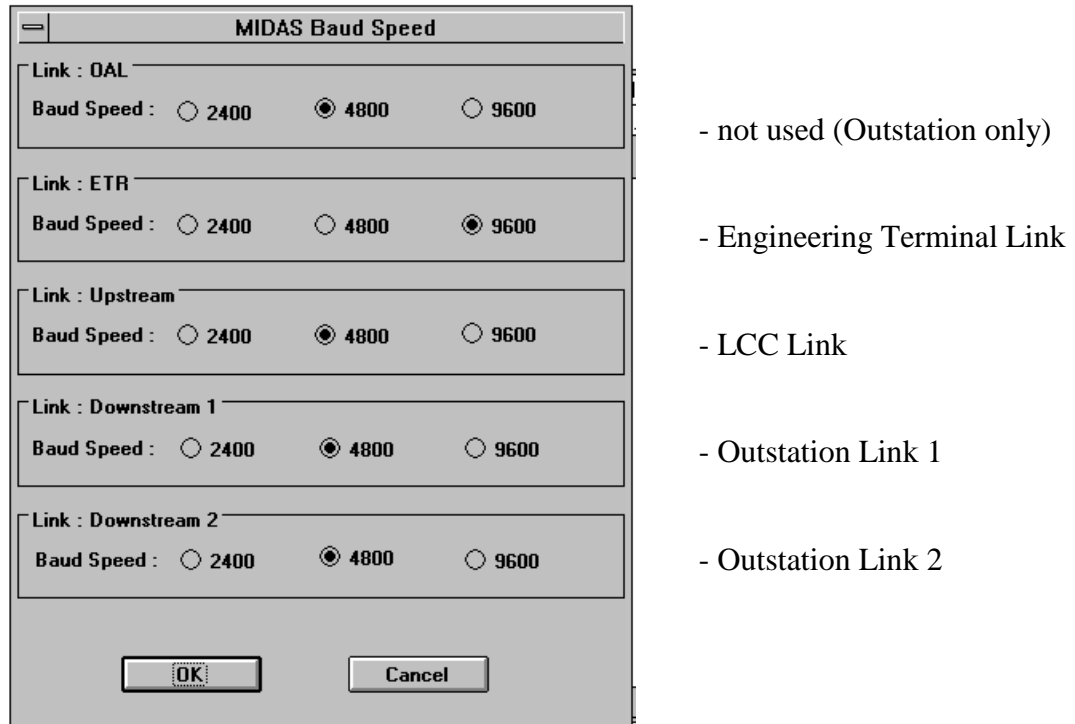


Figure 18 - Baud Speed Dialog Box

6.7 Help

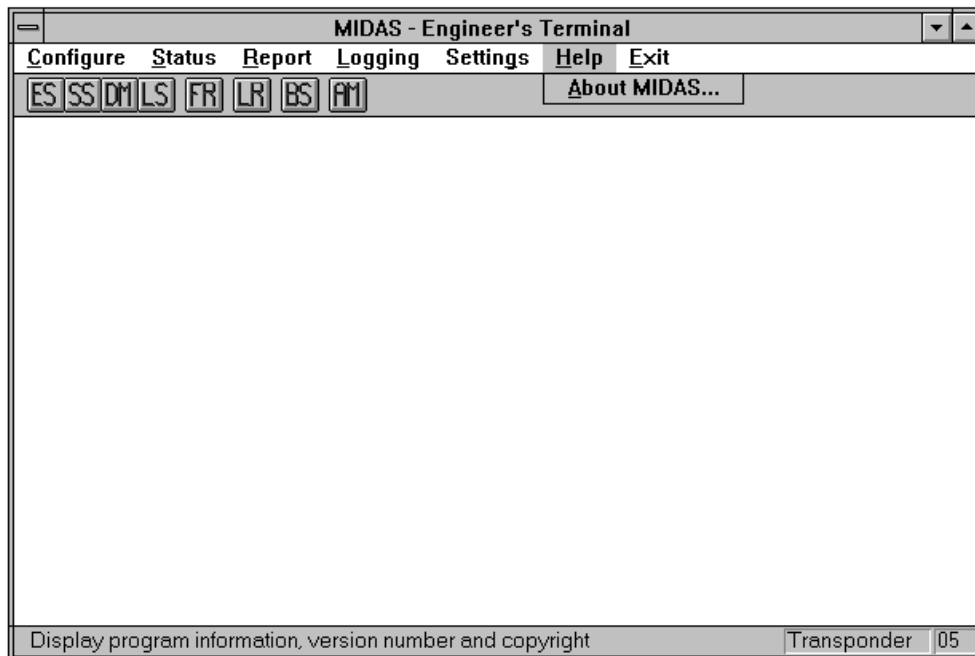


Figure 19 - Help Menu Option

6.7.1 About MIDAS...

This facility displays a view-only dialog box with the data obtained from the “About” message. Click on the <OK> button to close the window.

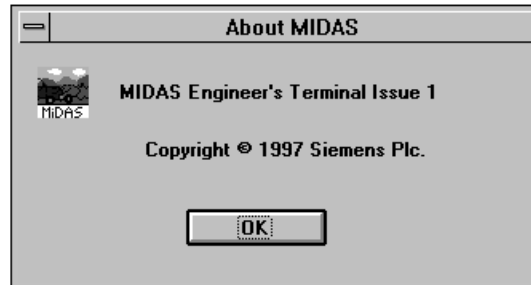


Figure 20 - About MIDAS Dialog Box

6.8 Exit

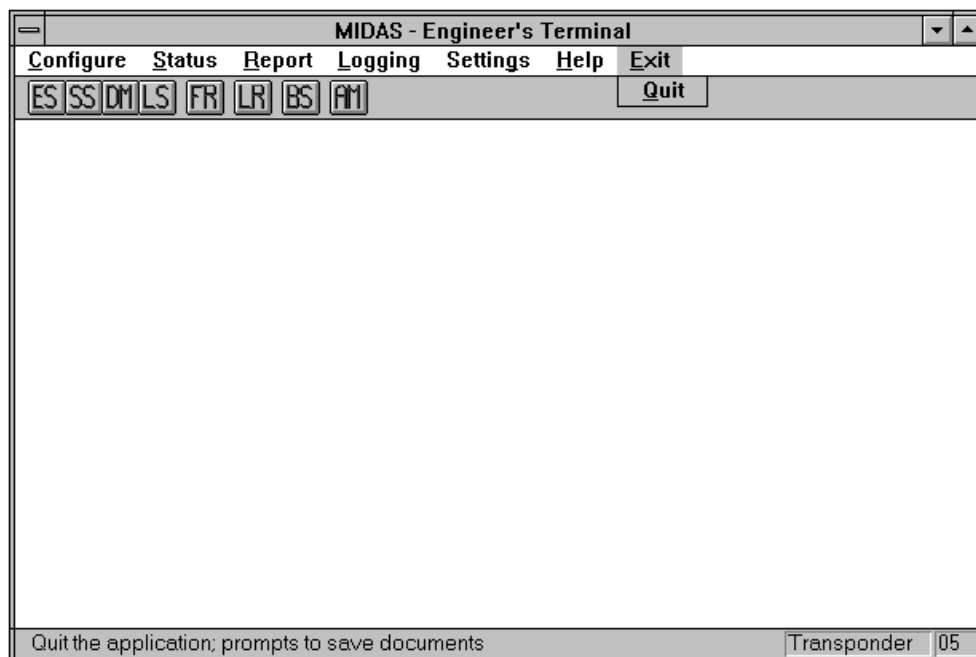


Figure 21 - Exit Menu Option

6.8.1 Quit

This facility exits the application.

7. TECHNICAL SPECIFICATION

7.1 Physical Characteristics

		Unpackaged - unit only	Packaged with installation kit
Size	height	130 mm	225 mm
	width	480 mm	580 mm
	depth	240 mm	465 mm
Approx. Weight	without battery	2.6 Kg	7.2 Kg
	without modem	5.1 Kg	9.7 Kg
	with battery (and modem if appropriate)	5.4 Kg	10.0 Kg

7.2 Power Requirements

	Mains Input
Voltage	85 - 260V AC
Frequency	47 - 440Hz
Rated current	150mA

7.3 Features

‘CE’ Certified.

MIDAS Transponder can communicate with up to 24 Outstations.

8 Transponders per LCC.

LCC link can be RS485 or V.26 Modem.

Provides monitoring of its own hardware functionality.

Provides monitoring of Outstation communications.

7.4 Safety

Meets Electrical Safety requirement EN 60950.

Meets Telecommunications Safety requirement EN 41003.

7.5 EMC

MIDAS Transponders meet the emission and susceptibility requirements of TRG 1068 (Feb. 1991).

7.6 Environmental Information

The roadside equipment meets the mechanical and temperature requirements of UK Department of Transport (Highways Agency) Specification TR2130B (May 1993).

Operating temperature from -15°C to +65°C.

Humidity + 95% (non-condensing).

7.7 Data Rates

Standard rates 2400, 4800, 9600.

Other rates programmable up to 38,400.

7.8 Battery Backup

Lead acid battery support - 20 hour operation.

SRAM memory support - 1 year.

7.9 Lightning Protection

Meets the requirements of CCITT K20.

7.10 Processor

32 bit Embedded Power PC.

Up to 512Kbyte PROM, 1Mbyte SRAM (Battery backed).

1Mbyte Flash.

4 Synchronous/Asynchronous Isolated RS485 ports.

2 Synchronous/Asynchronous RS232 ports.

1 Asynchronous RS232 port.

JTAG Interface.

Real Time Clock.

7.11 Modem (Optional)

See the MIDAS V.26 Modem Installation, Commissioning and Maintenance Handbook, details of which are given in Section 1.3.

7.12 Engineer's Terminal

The hardware needed to run the MIDAS Engineer's Terminal software is a standard (IBM compatible) portable PC with a suitable lead to connect to the 9-pin 'D' type socket located on the front of the Power PC Processor PCB.

The PC must have the following features as minimum requirements:

- Processor of the 80386 family
- 4 Mb of RAM
- Hard disk drive with minimum capacity 40Mb ("C" drive)
- 1 x integral floppy disk drive (3.5", 1.44Mb) or access to one
- 1 x RS232C 9 way serial port; required cable connections as defined by STCL. (Part number 667/1/24661/000)
- 1 x standard 25 pin parallel printer port
- Operating system MS-DOS® (version 3.3 minimum)
- Microsoft® Windows® version 3.1 or greater
- Standard size display screen (80 column x 25 lines) CGA compatible, colour or monochrome
- Power supply from mains (with adapter) and batteries (rechargeable)
- Full QWERTY keyboard

In addition, a mouse or trackerball would be a desirable option.

APPENDIX A - TECHNICAL DRAWINGS

This Appendix contains the following drawings:

667/GA/26766/000-003	Transponde r - General
667/GA/26791/000	PSU battery cable form
667/GA/26748/000	PSU socket assembly
667/GA/26774/000	MIDAS Installation Kit
667/GA/26771/ETCComm	s I/O PCB Kit
667/DA/26771/ETCComm	s I/O PCB Kit
667/GA/26601/ETC	Power Processor PCB Assembly
667/DA/26601/ETC	Power Processor PCB Assembly
667/GA/20982/ETC	RS485 External Line Protection
667/DA/20982/ETC	RS485 External Line Protection
667/GA/26769/ETC	V26 Modem PCB Assy
667/DA/26769/ETC	V26 Modem Circuit Diagram

The drawings are not included in the page numbering of this document.

APPENDIX B - PARTS LISTS

This Appendix contains parts list and drawing information for the following Siemens MIDAS product: Transponder. For each product a hierarchical breakdown of the main components is given in the form of a tree structure. References to technical drawings are given as part of the tree structure. Those technical drawings needed for the maintenance of the equipment are given in Appendix A.

This Appendix is split into two sections.

The first section provides a family tree for the equipment. The trees show:

- the component number for the parts list of each product,
- the part numbers of technical drawings which are relevant to the product.

The second section contains a number of parts lists. These are ordered according to the component number.

The following pages in this Appendix are not included in the page numbering of this document.

APPENDIX C - PART NUMBERS

Equipment Description	Part No
Address Header	667/1/26774/000
Battery Backup fuse	518/4/90285/007
Comms I/O PCB	667/1/26747/000
Line Protection Module fuse	518/4/90284/005
Mains fuse	518/4/90284/004
Modem fuse	518/4/90285/004
Power PC Processor PCB Battery	418/4/39820/000
Power Supply Battery	418/4/42314/023
Power Supply Unit	605/4/97048/000
RS485 Line Protection Module PCB	667/1/20982/000
Transponder Power PC Processor PCB (Containing Transponder PROM)	667/1/26601/100 667/1/12750/000
V.26 Modem	667/1/26768/000
Engineer's Terminal Software	667/1/26752/000

INDEX

—A—

About MIDAS.....	40
Address.....	31
Address Header9. <i>See also</i> Board Address Header	
Fit.....	18
Program.....	18
AM.....	30

—B—

Battery.....	8, 9, 13
Backup.....	42
Charger.....	15
Charger fault.....	23
Fuse.....	29
Low fault.....	23
Replacement.....	21, 27, 28
Baud Speed.....	38
Board Address Header.....	15
British Standards.....	7
BS.....	30

—C—

Cables.....	14, 17
CCITT.....	7
Circuit Diagrams.....	44
Commissioning.....	20
Comms I/O PCB.....9, 15, 19	
Default settings.....	25
Replacement.....	27

—D—

Data Rates.....	42
Default settings.....	25
DIAG.....	14
Drawings.....6, 44, 45	
General Assembly.....	44

—E—

Earth.....	18, 28
Cable.....	14
Engineer's Terminal.....9, 14, 30, 43	
Environmental Requirements.....	42
Exit.....	40

—F—

Faults.....	22
Finding.....	33
Report.....	34
Features.....	41
FR.....	30
Frequency.....	41
Functionality.....	9
Fuse.....	
Part Numbers.....	46
Replacement.....	29

—G—

General Assembly Drawings.....	44
--------------------------------	----

—H—

HDLC Cable.....	<i>See</i> V.26 Modem Cable
Health and Safety.....	6, 8
Help.....	39

—I—

IEC320.....	14
Installation.....	
Kit.....	16
Instation.....	9

—K—

Klippon block.....	14, 16
--------------------	--------

—L—

LCC.....	9
LEDs.....	14
Line Protection Module.....	<i>See</i> RS485
Link Data Rates.....	26
Logging.....	36
LR.....	30

—M—

Mains.....	19
Cable.....	14
Fail.....	8
Fault.....	23
Fuse.....	29
Maintenance.....	
Routine.....	21
Modem.....	
Communications lost.....	24
Monitor circuits.....	15

—O—

Outstation.....	
Not responding.....	24
System Handbook.....	6
Unobtainable.....	23

—P—

Part Numbers.....	46
PDU.....	
Connection.....	19
Physical Characteristics.....	41
Power PC Processor PCB.....9, 14	
Connections.....	18
Default settings.....	25
Replacement.....	27

Power Requirements.....	41
Power Supply	13
Battery Backup.....	21
Battery Replacement	28
Replacement.....	28
Unit	9
PRC ERR	14, 22
Processor Features	42
PSU	<i>See</i> Power Supply

Sealed Lead Acid Batteries	8
Settings	38
Size	41
Spares.....	21
Specification	
Engineer's Terminal	43
SS	30
Station Status Data.....	32
System Overview	9

—Q—

Quit.....	40
-----------	----

—R—

RAM Battery Backup	21
Rated current	41
Reset	15, 22, 24, 25
RS485	9
Cable	14
Communications channels	15
Communications lost.....	24
Connections	17
Flying Earth Lead.....	18
Line Protection Module	13, 16
Fuse	29
PCB	9, 15
Replacement	28
RUN	14, 22

—S—

Safety Instructions	8
---------------------------	---

—T—

Tools	16
-------------	----

—V—

V.26 Modem	6
Cable.....	14, 17
Commissioning.....	20
Connections	18
Default settings.....	25
Earth Lead	18
Fuse	29
Interface	14
PCB	9, 15
Replacement	28
Voltage.....	13, 41

—W—

W/D FAIL.....	14, 22
Watchdog link.....	25
Weight.....	41

Last page of the MIDAS Transponder System Handbook